A guide vane (300) for a turbomachine, having a sealing device (27, 27') at the radially inner end region of the guide vane (300) for sealing leakage flows (25) between the guide vane (300) and an inner ring (7) joined thereto. The sealing device (27, 27') is movably configured relative to the guide vane (300). The sealing device (27, 27') is positionable in at least one open or in a closed configuration for sealing the leakage flows (25). Also, a guide vane (100), as well as a turbomachine.
GUIDE VANE FOR A TURBOMACHINE HAVING A SEALING DEVICE; STATOR, AS WELL AS TURBOMACHINE.

[0001] This claims the benefit of German Patent Application DE 10 2013 222 980.1, filed Nov. 12, 2013 and hereby incorporated by reference herein.

[0002] The present invention relates to a guide vane for a turbomachine having a sealing device at the radially inner end region of the guide vane. The present invention also relates to a stator, as well as to a turbomachine.

BACKGROUND

[0003] In turbomachines, efficiency is influenced by various factors and parameters. In particular, efficiency is reduced by flow losses resulting from bypass flows outside of the main flow through the rotor blade and stator blade. There are different ways to at least reduce such bypass flows in order to avoid efficiency losses. For example, seals are configured on vane assemblies of the turbomachine in order to reduce bypass flows.

SUMMARY OF THE INVENTION

[0004] It is an object of the present invention to provide a further guide vane for a turbomachine that is designed for a sealing device at the radially inner end region of the guide vane for sealing leakage flows between the guide vane and an inner ring joined thereto. It is also an object of the present invention to provide an appropriate stator, as well as a turbomachine.

[0005] The present invention provides a sealing device that is movably configured relative to the guide vane. The sealing device is positionable in at least one open or in a closed configuration for sealing the leakage flows.

[0006] The stator according to the present invention has at least one guide vane according to the present invention. The stator may be a section of a compressor stage. The stator may be referred to as a guide vane wheel.

[0007] The turbomachine according to the present invention has at least one stator according to the present invention. The turbomachine may be a gas turbine or an aircraft engine.

[0008] In all of the explanations above and in the following, the expressions "may be," respectively "may have" etc. are synonymous with "is preferably," respectively "has preferably" etc. and are intended to clarify specific embodiments according to the present invention.

[0009] Whenever numerical words are mentioned herein, one skilled in the art understands these to indicate a numerically lower limit Provided that this does not lead to a contradiction that one skilled in the art can recognize, he/she always reads "at least one" when "one" is indicated, for example. This understanding is likewise included in the present invention, as is the interpretation whereby a numerical word such as "one," for example, may alternatively mean "exactly one," wherever one skilled in the art recognizes this as being technically feasible. Both are included in the present invention and apply to all of the numerical words used herein.

[0010] Inventive specific embodiments may include one or more of the features mentioned in the following.

[0011] In some of the specific embodiments according to the present invention, the turbomachine is an axial turbomachine, in particular a gas turbine. The gas turbine may be an aircraft engine.

[0012] In many specific embodiments according to the present invention, the guide vane is a guide vane of a compressor stage, for example, of a low-pressure compressor stage and/or of a high-pressure compressor stage.

[0013] In certain specific embodiments according to the present invention, a plurality of guide vanes configured in the circumferential direction of the turbomachine are joined to the inner ring. The guide vanes and the inner ring joined thereto may be referred to as guide vane ring or stator or stator rim.

[0014] In some of the specific embodiments according to the present invention, the inner ring is designed and configured for being joined to a seal carrier. The connection, in particular, has a detachable design, such as that provided by a tongue and groove connection. For example, the inner ring has a groove or a collar onto which the guide vane ring of the seal carriers is slid circumferentially.

[0015] In certain specific embodiments according to the present invention, the sealing device is configured, positioned or supported translationally and/or rotationally (rotatably) relative to the guide vane. In particular, the sealing device is movable in a direction orthogonal to the longitudinal axis of the guide vane. The sealing device is movable at the radially inner end region of the guide vane in the region of a guide vane platform, for example, in order to at least reduce a leakage flow.

[0016] In certain specific embodiments according to the present invention, the sealing device is positioned in an open configuration, "open configuration" signifying an opened or open flow cross section of a leakage flow that is not or is at least not completely sealed by the sealing device in this configuration. This position may be described as an installation position. In the installation position, the sealing device is not or not yet positioned in a manner that makes it possible to seal or reduce the leakage flow. Only after moving (translationally and/or rotationally) out of this installation position is a leakage flow effectively at least partially reduced.

[0017] In some specific embodiments according to the present invention, the sealing device is positioned in a closed configuration for sealing the leakage flows. In the closed configuration, the sealing device or a portion thereof at least partially seals a flow cross section of a leakage flow.

[0018] In many specific embodiments according to the present invention, the location or the position of the sealing device in the closed configuration is referred to as the hook position. In the hook position, the sealing device may be moved or displaced until it rests against one or a plurality of hooks acting as a limit stop. The hook may be referred to as a stop hook. In the hook position, the sealing device is able to seal a gap or an area of a flow cross section of a leakage flow. In the hook position, the sealing device may advantageously at least reduce the leakage flow.

[0019] In some of the specific embodiments according to the present invention, the stop hook limits the displacement path of the sealing device. The stop hook may be referred to as a securing hook. It may likewise limit rotations of the sealing device. The center of rotation for limiting the rotational movement of the sealing device may reside within or outside of the sealing device. In other words, the sealing device may rotate about the center of rotation of the stop hook(s).

[0020] In certain specific embodiments according to the present invention, the sealing device or portions thereof are moved by the leakage flow. For example, the flow pressure of
the leakage flow may be great enough to change the position of the sealing device. This movement of the sealing device may be referred to as pressure-controlled movement. The sealing device or at least a portion thereof may be moved solely by the leakage flow.

[0021] In certain specific embodiments according to the present invention, the guide vane is rotatably mounted about a longitudinal axis thereof. In particular, the radially inner and/or outer ends of the guide vanes are provided with projections or pivot pins within which or about which the guide vanes rotate. The radially outer pivot pin may be referred to as outer pivot pin; the radially inner pivot pin as inner pivot pin.

[0022] In some specific embodiments according to the present invention, the inner pivot pin may be configured or guided in the inner ring. Configured in the inner ring, in particular, are bushings, for example bearing bushings, in which the guide vanes rotate.

[0023] The rotation angle of the guide vanes about the longitudinal axis thereof may be referred to as adjustment angle.

[0024] In many specific embodiments according to the present invention, the sealing device is a plate or a slide plate.

[0025] In particular, the sealing device is fabricated of metal or features metal.

[0026] In certain specific embodiments according to the present invention, the sealing device has a bore or a through bore for allowing throughflow of at least a portion of the leakage flow. The bore is configured, in particular, perpendicularly to the surface of the slide plate. The slide plate may be moved in the guide vane by the bore and a pressurized leakage flow. In particular, the slide plate is moved from the installation position into the closed position, or hook position.

[0027] In certain specific embodiments according to the present invention, the sealing device and/or the guide vane have/has at least two stop hooks. Relative to a central axis of the sealing device, the stop hooks may be configured asymmetrically in one displacement direction of the sealing device. The stop hook geometry may be configured and optimized in a way that allows all possible positions of the sealing device, including possible limit positions, to prevent the sealing device from becoming jammed in the guide vane.

[0028] In some of the specific embodiments according to the present invention, the sealing device is configured in a pocket shape in a guide vane platform.

[0029] In many specific embodiments according to the present invention, the guide vane and/or the sealing device are/is produced using an additive manufacturing process. The additive manufacturing process may be a selective laser melting process (selective laser melting—SLM).

[0030] Many or all of the specific embodiments according to the present invention may feature one, a plurality of, or all of the advantages mentioned above and/or in the following.

[0031] Using the guide vane according to the present invention, it is at least advantageously possible to reduce the leakage flow in the connection region between the guide vane and the inner ring that, in particular, is joined to a seal carrier in a stator. By reducing the leakage flow, it is possible to increase the efficiency of a turbomachine in which the stator is installed. The seal carrier may have an abradable seal or be joined thereto.

[0032] The guide vane according to the present invention makes it advantageously possible to at least reduce the influence of the flow in the adjacent guide vanes in a stator in the installed state, in that the leakage flow is at least reduced in the connection region between the guide vane and the inner ring. Reducing the extent to which the flow is influenced, in particular the flow incident to the leading edge of adjacent guide vanes, may lead to an improvement in the flow around adjacent guide vanes and thus improve the efficiency of the flow around the guide vanes. Reducing the influence of the flow of adjacent guide vanes in the installed state may enhance the pump stability of a compressor stage in which the stator may be installed.

[0033] The guide vane according to the present invention and/or the sealing device according to the present invention may be advantageously produced inexpensively using an additive manufacturing process, in particular by selective laser melting.

BRIEF DESCRIPTION OF THE DRAWINGS

[0034] The present invention is explained exemplarily in the following with reference to the accompanying drawings, in which identical reference numerals denote like or similar components. It holds for each of the schematically simplified figures that:

[0035] FIG. 1 shows a detail of a stator rim according to the related art;

[0036] FIG. 2 shows a leakage flow between a guide vane platform and an inner ring of the related art;

[0037] FIG. 3 shows the leakage flow from FIG. 2 in a perspective view including an adjacent guide vane according to the related art;

[0038] FIGS. 4a, b, c show a guide vane according to the present invention including a sealing device and two stop hooks on the guide vane;

[0039] FIGS. 5a, b show a further guide vane according to the present invention;

[0040] FIGS. 6a, b show the guide vanes according to the present invention from

[0041] FIGS. 4a and 4b in a perspective view;

[0042] FIGS. 7a, b show the guide vanes according to the present invention from FIGS. 5a and 5b in a perspective view;

[0043] FIGS. 8a, b, c show the guide vanes according to the present invention from FIGS. 4a, 4b, 6a and 6b having different adjustment angles for the guide vanes;

[0044] FIGS. 9a, b show a guide vane according to the present invention including a further sealing device and two further stop hooks;

[0045] FIGS. 10a, b, c show the guide vanes according to the present invention from FIG. 9b in perspective views and as a sectional representation; and

[0046] FIGS. 11a, b, c, d show the steps for installing the slide plate from FIG. 9a.

DETAILED DESCRIPTION

[0047] FIG. 1 shows a detail of a stator rim 100 in a perspective view according to the related art.

[0048] Stator rim 100 has a plurality of guide vanes 200 that are disposed side-by-side in circumferential direction u. Guide vanes 200 each have outer pivot pins 1 that are joined at the radially outer end to a casing of a turbomachine (not shown in FIG. 1), in particular of a gas turbine. The radially inner end of outer pivot pins 1 is joined to guide vane profiles 3.
The radially inner ends of guide vane profiles 3 are connected by pins 5 (respectively pivot pins) to an inner ring 7 of stator rim 100 (see FIG. 2). Inner ring 7 is connected to an annular seal carrier 9.

Inner ring 7 and seal carrier 9 are subdivided in particular into two semicircular segments that are slid into one another circumferentially.

Seal carrier 9 may be joined to abradable seals or abradable sealing segments.

FIG. 2 shows a detail from FIG. 1 in a sectional view including a guide vane platform 11 and inner ring 7 according to the related art.

Guide vane 200 is connected to inner ring 7 via pin 5 and a bushing 13. Bushing 13 is additionally inserted into a bore 15 of inner ring 7 to fix pin 5 in inner ring 7 and/or is used as a bearing bushing for rotations of guide vane 200 about a longitudinal axis 14.

Seal carrier 9 and inner ring 7, which are both designed as semicircular segments, in particular, may both be slid into one another in circumferential direction u. In the installed state, the segments are secured (relative to one another) by a securing pin 17 against a displacement of seal carrier 9 and inner ring 7.

Joined to seal carrier 9 are abradable seals 19 that are provided for forming a sealing gap between sealing peaks 21, for example of a rotating shaft 23. ABRADABLE SEALS 19 are designed, in particular, to be segmented over the circumference.

In accordance with the related art, a leakage flow 25 forms, in particular, between guide vane platform 11 and inner ring 7. In response to the pressure differential, leakage flow 25 flows from the pressure side of the vane profile to the suction side.

FIG. 3 shows leakage flow 25 from FIG. 2 in a perspective view including an adjacent guide vane 200' according to the related art.

A portion of leakage flow 25' (leakage flow 25' may be described as an air jet) may flow from leakage flow 25 of guide vane 200 emerging between guide vane platform 11 and inner ring 7, in the direction of incident flow edge of adjacent guide vane 200' and thus disturb the airflow incident to guide vane 200'. This may lead to efficiency losses.

In one plane having the axes circumferential direction u and axial direction a, orthogonally to radial direction r, FIG. 4a shows a sectional view of a guide vane 300 according to the present invention having a sealing device 27 and two stop hooks 29 that are connected to guide vane 300. The sectional view of FIG. 4a is disposed approximately in the center in radial direction r at the level of guide vane platform 11 (see FIG. 6).

Guide vane profile 3 (see FIG. 6) is not visible in this sectional plane, but is sketched in dashed lines to illustrate the configuration of sealing device 27. Pin 5 (disposed radially inwardly relative to guide vane platform 11) is likewise shown in dashed lines since it is not visible in this sectional view. Pin 5 is shown, for example, in FIGS. 6a and 5b.

In this exemplary embodiment, sealing device 27 is designed as a slide plate 27. In the sectional plane shown in FIG. 4a, slide plate 27 may move in circumferential direction u and in axial direction a (displacement path 28), not, however, in radial direction r (see FIG. 6). The movement is limited by both stop hooks 29 against which both offsets 31 of slide plate 27 may rest.

The position of slide plate 27 shown in FIG. 4a may be referred to as installation position.

Slide plate 27 may rotate within the described freedom of movement about a center of rotation 33 of stop hooks 29 with a rotation angle 30.

In a dashed representation, slide plate 27 is shown in a hook position 35. In hook position 35, the maximum displacement path of slide plate 27 is reached relative to the initial position (installation position).

Circle 37 represents bore 37 in inner ring 7 for accommodating guide vane platform 11 of guide vane 300 (see FIGS. 1 and 2). In response to this bore 37 being subject to possible wear due, for example, to rotations of guide vane 300 according to the present invention about longitudinal axis 14 thereof (orthogonally to the drawing plane) and/or in response to thermal material expansions during operation, bore 37 of inner ring 7 may be or become displaced. Dashed circle 39 represents a maximum displacement of bore 37 as the result of wear.

Relative to previously described hook position 35 of slide plate 27, slide plate 27 may at least partially cover, respectively seal gap 41 between outer boundary edge 43 of guide vane platform 11 and of bore 37 and thereby at least partially prevent a leakage flow 25 (see FIG. 3).

In addition, FIG. 4a shows an access bore 45 that is configured in the bottom side (radially inner side) of guide vane platform 11. The function of access bore 45 is described in FIG. 4b.

FIG. 4b shows slide plate 27 in a position that is displaced relative to the initial position (installation position) in which gap 41 is regionally covered or sealed by slide plate 27. This position may be referred to as nominal position (in the installed state and pressurized).

In region 47, slide plate 27 rests against bore 37 of inner ring 7. Offset 31 of slide plate 27, which is upwardly disposed in FIG. 4b, rests against upper stop hook 29. On the other hand, lower offset 31 does not rest against lower stop hook 29. This would at least be possible, however, in the case of a worn bore 39 (see FIG. 4a).

Slide plate 27 may be moved and shifted from the initial position (FIG. 4a) into the displaced position (FIG. 4b) by a flow that flows through access bore 45, respectively by the pressure force induced by this flow. Arrow 49 depicts the direction of the pressure force of this flow.

FIG. 4c shows an alternative, shifted contour 51 (or retraction of the contour) of slide plate 27. Due to displaced contour 51, abutting region 47' of slide plate 27 is likewise shifted at the bore of inner ring 7. In possible alternative contour 51 shown exemplarily here, abutting region 47' (or the point of contact) is downwardly displaced in FIG. 4c. Other contour shapes could displace abutting region 47' still further downwardly or further upwardly, for example.

The covered or sealed region of gap 41 between bore 37 (or worn bore 39) and the outer boundary edge of guide vane platform 43 is influenced by a displacement of abutting region 47. This may be particularly relevant and advantageous when the intention is to cover the outflow region of leakage outflow 25 (see FIG. 3) as precisely as possible, for example, to selectively optimize efficiency. It is also possible to modify and influence the outflow region of leakage outflow 25 by the rotation of guide vane 300 according to the present invention about longitudinal axis 14 thereof. The rotation of guide vane 300 according to the present invention, respectively the position of guide vane profile 3 relative to the
incident flow thereof may essentially depend on the flow conditions prevailing in the turbomachine, that are influenced, for example, by a full-load or partial-load operating state.

[0073] FIG. 5a shows another guide vane 300 according to the present invention. Stop hooks 29 are displaced (or inverted) relative to the configuration from FIG. 4a-c. In correspondence with stop hooks 29, offsets 31 of slide plate 27 are likewise displaced. Slide plate 27 is configured in the initial or installation position.

[0074] The remaining description of FIG. 4a-c holds analogously for FIG. 5a. FIG. 5b shows further guide vane 300 according to the present invention from FIG. 5a in a pressurized position (or nominal position). In region 47, slide plate 27 rests against bore 37.

[0075] FIG. 6a shows guide vane 300 according to the present invention from FIG. 4a and FIG. 4b in a perspective view.

[0076] In this view, a slot 53 is discernible in guide vane platform 11 in which slide plate 27 is movably configured (in the plane having axial direction a and circumferential direction u). In the installation position thereof, slide plate 27 is completely integrated in slot 53 and does not project beyond outer boundary edge 43 of guide vane platform 11.

[0077] Slide plate 27 may project out of slot 53, but not fall out, particularly in a pressurized position of slide plate 27, in which a pressure force acts from the radially inner side of guide vane platform 11 (covered underneath guide vane platform 11 in FIG. 6a). Slide plate 27 is prevented from falling out by stop hooks 29 on guide vane 300 and on offsets 31 at slide plate 27.

[0078] FIG. 6b shows guide vane 300 according to the present invention from FIG. 6a in a rotated perspective view from radially inwardly to radially outwardly.

[0079] In this view, open access bore 45 is directly visible.

[0080] FIG. 7a shows guide vane 300 according to the present invention from FIG. 5a and FIG. 5b in a perspective view.

[0081] In comparison to guide vane 300 according to the present invention from FIG. 4a, 4b, 4c and from FIGS. 6a and 6b, stop hook 29 at guide vane 300 is configured in the outer region of guide vane platform 11. On the other hand, offset 31 of slide plate 27 is configured further inwardly.

[0082] Slide plate 27 projects beyond outer boundary edge 43 of guide vane platform 11. This is particularly the case when slide plate 27 is pressurized in the installed state of guide vanes 300, i.e., slide plate 27 has been moved outwardly or shifted in response to a pressurizing throughflow (in particular, of a leakage flow) through access bore 45.

[0083] FIG. 7b shows guide vane 300 according to the present invention from FIG. 7a in a rotated perspective view from radially inwardly to radially outwardly, including open access bore 45.

[0084] FIG. 8a shows three different specific embodiments of guide vanes 200, 300, 300 in an inner ring 7 in perspective views.

[0085] Guide vane 200 corresponds to the related art and was described in FIGS. 1, 2 and 3.

[0086] Guide vane 300 according to the present invention was described in FIG. 4a-c and 6a, b; guide vane 300 according to the present invention was described in FIGS. 5a, 5b and FIG. 5c, 5d, 5e.

[0087] FIG. 8b shows two guide vanes 300 according to the present invention in a positioning angle that is changed relative to FIG. 8a. Positioning angle signifies the angle of guide vane 300 about the longitudinal axis thereof. In comparison to FIG. 8a, profiles 3 of guide vanes 300 are oriented further in circumferential direction u in FIG. 8b. This modified positioning angle influences slide plate 27. In FIG. 8a, slide plate 27 of guide vane 300 moves in a direction obliquely to circumferential direction u and axial direction to allow slide plate 27 to seal gap 41 (the leakage flow passing there-through). In FIG. 8b, slide plate 27 is oriented in a direction virtually parallel to axial direction in order to seal gap 41.

[0088] FIG. 8c shows the configuration of guide vane 300 according to the present invention from FIG. 8b in another perspective view.

[0089] Depending on the positioning angle of guide vanes 300, at least one region of guide vane platform 11 may project beyond the surface of inner ring 7. Slide plate 27, slot 53, stop hook 29 and offset 31 were structurally designed to largely rule out any jamming and ensure the functioning of slide plate 27. This is achieved, in particular, by providing stop hooks 29 in different design variants, such as, for example, positioning of the center of rotation of stop hooks 33 (see FIG. 4a).

[0090] In addition, the shape of the region of slide plate 27 that projects beyond outer boundary edge 43 of guide vane platform 11, and/or the positioning (depth) of slide plate 27 along with corresponding contact portion 47 (see FIG. 4b and FIG. 4c) may be configured at the bore of inner ring 37 to allow this contact portion 47 to still come to be even in the context of maximum adjustment angles and maximum wear of the bore of inner ring 37 (offsetting of the inner ring-bore).

[0091] FIG. 9a shows another guide vane 300 according to the present invention having a further sealing device 27 and two further stop hooks 29 in an installation position relative to the inner ring assembly. In this installation position, guide vane 300 may be inserted into or mounted in an inner ring 7 (see FIG. 8a through 8c). In FIG. 9a, inner ring 7 is indicated by circle 37 or bore 37.

[0092] Further sealing device 27 is configured as slide plate 27. Both slide plate 27, as well as two further stop hooks 29 are structurally designed to allow slide plate 27 as a resilient element, to be slid onto or over stop hooks 29 and installed. This assembly operation is described in greater detail in FIG. 11a through 11d.

[0093] In contrast to the previously illustrated circular access bore 45 in FIG. 4 through 8, further access bore 45 features a rounded triangular shape. In comparison to the circular cross-sectional shape, this triangular cross-sectional shape is larger to allow the throughflow of fluid. Thus, the pressure force induced by this flow may advantageously move slide plate 27 more simply and readily in the operating state or in the specific application and at least partially close gap 41 to inner ring 7. This makes it possible to at least partially reduce previously discussed leakage flow 25.

[0094] FIG. 9b shows guide vane 300 according to the present invention from FIG. 9a in the closed state. In contrast to the open or installation state from FIG. 9a, in the closed state, slide 27 seals gap 41 in certain regions. In terms of structural design, this region is selected to allow a gap flow 25 or leakage flow 25 (see FIG. 2) to be at least partially reduced on the suction side of vane profile 3.

[0095] In response to the pressure force of the flow, slide 27 is moved through access bore 45 toward displacement path 28 to the edge of bore 37 of inner ring 7.

[0096] Slide 27 rests by both offsets 31 against stop hooks 29.
The configuration of this guide vane corresponds to a variant that does not have any center of rotation (see FIG. 4c).

Sectional plane B-B is shown in FIG. 10c.

FIG. 10a shows guide vane 300° according to the present invention from FIG. 9b in a perspective view. The discussion of FIG. 6a holds analogously for slide plate 27°, stop hook 29°, etc.

FIG. 10b shows guide vane 300° according to the present invention from FIG. 9b in a further perspective view. The discussion pertaining to FIG. 6b holds here analogously for the modified design of slide plate 27°, for stop hook 29°, and for other modified regions.

FIG. 10c: Guide vane 300° according to the present invention from FIG. 9b as a sectional representation B-B. Clearly discernible in this view is access bore 45° that is used for moving slide plate 27° within guide vane platform 11.

FIG. 11a shows the first step for mounting slide plate 27° on stop hook 29° of guide vane platform 11° of guide vane 300° according to the present invention.

Slide plate 27° is first placed by upper offset 31° thereof on upper stop hook 29° and hooked in. Lower offset 31° is subsequently placed or put on lower stop hook 29°.

FIG. 11b shows the second step for mounting slide plate 27° on guide vane platform 11°. Slide plate 27° is moved or pressed in arrow direction 55, allowing lower offset 31° to be slid over stop hook 29° by an elastic deformation of slide plate 27°. This procedure may be described as “clipping in.”

FIG. 11c shows the third step for mounting slide plate 27°. Slide plate 27° is in the installed position, and guide vane 300° may be slid onto inner ring 7 or be joined thereto (see FIG. 8a through 8c). In this installation position, gap 41 is not yet closed.

FIG. 11d shows the fourth step for mounting slide plate 27°. This step is no longer included in the actual installation. In this step, pressure is applied through access bore 45° (see FIG. 10c) for moving and sealing gap 41, at least in a partial region of gap 41 (see FIG. 9b). Slide plate 27° subsequently rests against bore 37 of inner ring 7. This region is shown as abutting region 47° of slide plate 27°.

The position of slide plate 27° may be referred to as sealing position.

LIST OF REFERENCE NUMERALS

100 stator, stator rim
1009 200 guide vane according to the related art
1100 300 guide vane according to the present invention
1111 aaxial: axial direction
1112 r radial; radial direction
1113 u circumferential direction
1114 1 outer pivot pin
1115 2 guide vane profile
1116 3 pivot pin, pivot pin
1117 7 inner ring
1118 9 seal carrier
1119 11, 11′ guide vane platform
120 13 bushing
1211 14 longitudinal axis of the guide vane
1215 16 bore
122 17 securing pin
124 19 abradable seal
125 21 sealing peaks
126 23 shaft
127 25 leakage flow
128 27, 27′ sealing device; slide plate
129 28 displacement path
130 29, 29′ stop hook on the guide vane
131 29 rotation angle
132 31, 31′ offset of the slide plate
133 33 center of rotation of the stop hooks
134 35 hook position of the slide plate
135 37 circle; bore
136 39 worn bore
137 41 gap
138 43, 43′ outer boundary edge of the guide vane platform
139 45 bore; access bore
140 47, 47′ abutting region of the slide plate
141 49 direction of the pressure force of the flow through the access bore
142 51 alternative contour of the slide plate
143 53 slot
144 55 arrow direction
145 1-10, (canceled)
111 guide vane for a turbomachine, the guide vane comprising:

- a sealing device at the radially inner end region of the guide vane for sealing leakage flows between the guide vane and an inner ring joined to the guide vane,

- the sealing device being movably configured relative to the guide vane, and the sealing device positionable in at least one open or in a closed configuration for sealing the leakage flows.

12. The guide vane as recited in claim 11 further comprising at least one stop hook for limiting a displacement path or a rotation angle of the sealing device.

13. The guide vane as recited in claim 11 wherein the sealing device has at least one stop hook for limiting a displacement path or a rotation angle of the sealing device.

14. The guide vane as recited in claim 11 wherein the guide vane is rotatably mounted about a longitudinal axis.

15. The guide vane as recited in claim 11 wherein the sealing device is a plate.

16. The guide vane as recited in claim 11 wherein the sealing device is a plate.

17. The guide vane as recited in claim 11 wherein the sealing device has a bore for allowing throughflow of at least a portion of the leakage flow.

18. The guide vane as recited in claim 11 wherein the sealing device has at least two stop hooks, the stop hooks configurable asymmetrically in one displacement direction of the sealing device relative to a central axis of the sealing device.

19. The guide vane as recited in claim 11 further comprising at least two stop hooks, the stop hooks configurable asymmetrically in one displacement direction of the sealing device relative to a central axis of the sealing device.

20. The guide vane as recited in claim 11 wherein the sealing device is configurable in a pocket shape in a guide vane platform.

21. The guide vane as recited in claim 11 wherein the sealing device is produced using an additive manufacturing process.

22. The guide vane as recited in claim 11 wherein the guide vane is produced using an additive manufacturing process.

23. A stator comprising at least one guide vane as recited in claim 11.

24. A turbomachine having a stator as recited in claim 22, the turbomachine being a gas turbine or an aircraft engine.